

What is claimed is:

- 1 1. A method for fixing a cardiac electrode on an exterior of a patient's heart,  
2 comprising the steps for:  
3 temporarily positioning an electrode at target locations about the heart;  
4 sensing electrical signals on the electrode at different locations about the heart;  
5 analyzing a selected parameter from the electrical signals sensed on the electrode  
6 at the different locations;  
7 determining from the analysis of a selected parameter a preferred one of the  
8 different locations for attachment of a cardiac electrode; and  
9 fixing a cardiac electrode on the exterior of the patient's heart at the preferred one  
10 location.
- 1 2. The method according to claim 1 in which temporary positioning of the electrode  
2 includes suction attachment to the epicardium with the electrode in contact therewith.
- 1 3. The method according to claim 1 in which analyzing a selected parameter includes  
2 determining the maximum interval between left and right ventricular contractions.
- 1 4. The method according to claim 1 in which analyzing a selected parameter includes  
2 determining a maximum depolarization interval.
- 1 5. The method according to claim 1 in which fixing the cardiac electrode includes

2 forming temporary suction attachment to the epicardium with the cardiac electrode  
3 retained thereby at the preferred one location; and  
4 fixing the cardiac electrode to the preferred one location on the epicardium.

1 6. The method according to claim 5 in which fixing the cardiac electrode includes  
2 rotating a helical distal end thereof into the epicardium in response to rotation of the  
3 cardiac electrode from a location therealong proximal the distal end thereof and spaced  
4 away from the patient.

1 7. A method for fixing a cardiac electrode on an exterior of a patient's heart,  
2 comprising the steps for:

3 temporarily positioning an electrode at different target locations about the heart;

4 supplying pacing signals to the electrode at each target location;

5 detecting activity of the patient's heart in response to pacing signals applied

6 thereto at each target location;

7 analyzing the detected activity to determine a preferred one of the different

8 locations for applying pacing signals; and

9 fixing a cardiac electrode on the exterior of the patient's heart at the preferred one

10 location for supplying pacing signals thereto.

1 8. The method according to claim 7 in which temporary positioning of the electrode

2 includes suction attachment to the epicardium with the electrode in contact therewith.

1 9. The method according to claim 7 in which analyzing the detected activity includes  
2 monitoring one of mitral valve regurgitation and fraction of volume ejected in response to  
3 applied pacing signals.

1 10. The method according to claim 7 in which fixing a cardiac electrode includes  
2 forming temporary suction attachment to the epicardium with the cardiac electrode  
3 retained thereby at the preferred one location; and

4 fixing the cardiac electrode to the preferred one location on the epicardium.

1 11. The method according to claim 10 in which fixing the cardiac electrode includes  
2 rotating a helical distal end thereof into the epicardium in response to rotation of the  
3 cardiac electrode from a location therealong proximal the distal end thereof and spaced  
4 away from the patient.

1 12. Apparatus for performing a surgical procedure on the heart of a patient through a  
2 working cavity in tissue between the heart and an entry incision, the apparatus  
3 comprising:

4 an instrument including a guide channel that houses a cardiac lead to extend  
5 between distal and proximal ends thereof, and including a suction port  
6 positioned on the distal end of the instrument for contacting a target site on  
7 the heart;

8 a suction channel within the instrument connected to the suction port and disposed  
9 to connect to a source of suction;

10 at least one electrode disposed on a surface of the suction port that contacts the  
11 heart;

12 the guide channel being reconfigurable to release the cardiac lead therefrom for  
13 leaving the cardiac lead anchored to the heart as the instrument is removed  
14 away from the cardiac lead.

1 13. Apparatus according to claim 12 in which the guide channel is axially slidable  
2 relative to the suction port for extending a distal end of the cardiac lead to contact the  
3 heart.

1 14. Apparatus according to claim 12 in which the guide channel includes an elongated  
2 slot extending between distal and proximal ends thereof for selectively releasing the  
3 cardiac lead retained therein.

1 15. Apparatus according to claim 14 in which the elongated slot is exposable by  
2 proximally sliding an upper segment of the guide channel relative to a lower segment  
3 thereof that is positioned relative to the suction port for exposing the slot in the lower  
4 segment between distal and proximal ends thereof.

1 16. Apparatus according to claim 12 in which the one electrode on said surface of the  
2 suction port is connected to a conductor that extends between the distal and proximal

3 ends of the instrument.

1 17. Apparatus for performing a surgical procedure on the heart of a patient through a  
2 working cavity in tissue between the heart and an entry incision, the apparatus  
3 comprising:

4 an endoscopic cannula configured for passing through the entry incision and  
5 working cavity toward the heart;

6 a suction attachment supported by the endoscopic cannula for contacting a target  
7 site on the heart under visualization through the endoscope;

8 an electrode positioned on a surface of the suction attachment that is disposed to  
9 contact the heart; and

10 a support channel for a cardiac lead that is disposed on the suction attachment and  
11 that is selectively configurable as a closed channel for confining a cardiac  
12 lead therein or as an open channel for releasing a cardiac lead therefrom.

1 18. Apparatus according to claim 17 including a conductor connected to the electrode  
2 and extending along the support channel to a proximal end thereof for connecting the  
3 electrode to a utilization circuit.

1 19. A surgical procedure for the placement of a cardiac lead in the heart of a patient  
2 under visualization through an endoscope by a delivery device including a cardiac lead  
3 clamp, a guide channel and a needle and at least one angled suction port at the distal end

4 of a closed cannula of the delivery device, the surgical procedure comprising:

5 attaching the suction port of the delivery device to the patient's heart in response

6 to applied suction for stabilizing the delivery device against the surface of

7 the heart;

8 advancing the needle forward from the delivery device to create an incision in the

9 heart;

10 clamping the cardiac lead into place by the cardiac lead clamp;

11 advancing the guide channel containing the cardiac lead along the needle into the

12 heart incision;

13 visualizing through the endoscope the placement of the cardiac lead into the heart;

14 anchoring the cardiac lead to the heart;

15 removing suction to release the delivery device containing the needle and guide

16 channel from the heart;

17 unclamping the cardiac lead from the cardiac lead clamp;

18 removing the guide channel from the delivery device while withdrawing the

19 needle from the heart;

20 removing the delivery device from the patient; and

21 removing the endoscope assembly from the patient while leaving the cardiac lead  
22 securely anchored in the heart.

1 20. The surgical procedure of claim 19 wherein anchoring further comprises:

2 rotating the cardiac lead from a location proximal the distal end and thereof spaced  
3 from the patient.

1 21. The surgical procedure of claim 19 wherein visualizing further comprises:

2 partially withdrawing the guide channel sufficiently to expose a position of the  
3 cardiac lead near the distal end thereof.

1 22. An apparatus for the placement of a cardiac lead in a heart of a patient, the  
2 apparatus comprising:

3 an endoscope assembly to provide visualization during placement of the cardiac  
4 lead;

5 an instrument channel eccentrically attached to the endoscope assembly; and

6 a delivery device for delivering and placing a cardiac lead in a heart of a patient,  
7 the delivery device comprising:

8 a housing;

9 an elongated body attached to the housing and extending distally therefrom;

10           a needle slidable along the elongated body for insertion into a heart;  
11           a clamp disposed within the housing for selectively grasping the cardiac  
12           lead;  
13           an actuation arm slidable disposed within the housing; and  
14           a guide channel attached to the actuation arm and slidable along the needle  
15           to contain a cardiac lead during placement of the cardiac lead into  
16           the heart.

1   23.   The delivery device of claim 22 wherein the elongated body further comprises:  
2           at least one angled suction port at the distal end of the elongated body for suction  
3           attachment to the surface of the heart.

1   24.   The delivery device of claim 22 wherein the guide channel is angled at the distal  
2   end.

1   25.   The delivery device of claim 22 wherein the guide channel is disposed to  
2   selectively confine the cardiac lead.

1   26.   The delivery device of claim 22 wherein the guide channel is a substantially  
2   hollow tubular body.

1   27.   The delivery device of claim 22 wherein the guide channel is a substantially planar  
2   body.



- 1 28. The delivery device of claim 22 wherein the needle is a substantially hollow
- 2 tubular body.